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Daboll's, Pike's, White's,
wrappers (worn), pp. 69, Ha

THE

CHILD'S ARITHMETIC,

BEING AN EASY AND CHEAP

INTRODUCTION

TO DABOLL'S, PIKE'S, WHITE'S,

AND OTHER ARITHMETICS;

DESIGNED TO RENDER BOTH TEACHING AND LEARNING AT ONCE SIMPLE AND INTERESTING.

HARTFORD:

PUBLISHED BY SAMUEL G. GOODRICH.

1818.

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101
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1818

DISTRICT OF CONNECTICUT, SS.

BE IT REMEMBERED; That L. S. *on the thirty first day of August, in the forty third year of the independence of the United States of America, Samuel G. Goodrich of the said District hath deposited in this office the title of a Book, the right whereof he claims as Proprietor, in the words following, to wit, "The Child's Arithmetic; being an "easy and cheap Introduction to Daboll's, Pike's, White's, "and other Arithmetics; designed to render both teach- "ing and learning at once simple and interesting."*

In conformity to the act of the Congress of the United States, entitled, "An act for the encouragement of learn- "ing, by securing the copies of Maps, Charts and Books, "to the authors and proprietors of such copies, during "the times therein mentioned."

R. I. INGERSOLL,
Clerk of the District of Connecticut.

A true copy of Record, examined and sealed by me,
R. I. INGERSOLL,
Clerk of the District of Connecticut.

0955057-190

PREFACE.

ARITHMETIC is an abstract, and at first a very uninviting study. Children who do not look to its utility, can see nothing in it but an unmeaning change of figures; which gives no present satisfaction, and promises no coming pleasure. It seems, therefore, every effort should be made to clothe this study in somewhat attractive colours; or at least to divest it, of all that is not necessarily difficult and disagreeable. But instead of this, the natural disadvantages of the subject are increased by the manner in which it is delivered. Our school arithmetics are written in a rigidly technical style, which, however clear and philosophical to mature and cultivated minds, is utterly incomprehensible to children. The consequence is, they are discouraged at the very threshold. They indeed learn the rules and definitions by rote, but they still do not know their meaning: they therefore despair of helping themselves with the book; they run to the teacher in every new case; they follow his directions mechanically, and thus go through a volume, without comprehending the principles of a single page.

It is the object of this little work, to open to children a more pleasant and successful access to this study. For this purpose I have not thought it necessary materially to alter the arrangement of Daboll. The only change made in this respect has been more completely to separate and distinguish the various rules. At the first outset of this study, a child cannot successfully pursue Simple Arithmetic and Federal Money, until he clearly understands one of them. The principal points of difference between this and other school arithmetics, are,—1st. The definitions are given in plain and simple language, and are then illustrated to the senses of the child.—2nd. The rules are also given in intelligible language, and are then clearly and minutely exemplified.—3rd. There is a gradation in the examples, the

first under a rule being very simple, and the others gradually advancing in difficulty.—4th. Every rule is exercised by practical questions, of such a nature as actually arise in the business of life.—5th. This only pretends to be an introduction to other books on arithmetic.

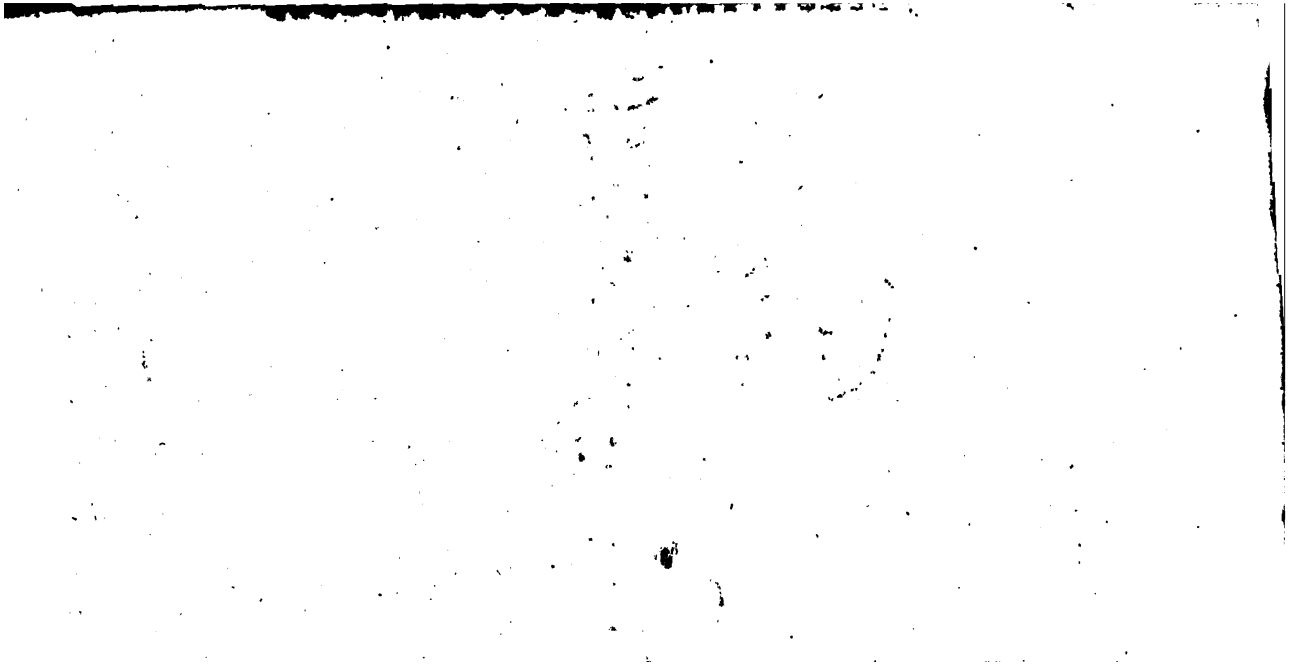
An author must be supposed partial to his own plan, and very naturally may attribute undue importance to it. However this may be in the present instance, I cannot believe this little book is entirely unneeded. Whoever has dealt with children has found that ideas introduced into their minds by sensible objects, are not only more perfectly formed, but are more permanently fixed, than those derived from verbal description. I do not know that in any supposable case, words are an equivalent with children to the palpable exposition of the eye or the touch. A child will better comprehend the number twenty, by laying before him so many apples or cents, than by ten pages of well written definition.

It is unnecessary to explain the difficulties which arise in the education of children, from the use of books above their capacity. The treble evils of disgusting their minds with all study; of clouding and perplexing their habits of thinking by the obscure conception of ideas; and of materially retarding their progress; are but a part of the mischiefs which flow from this source. In regard to arithmetic, these remarks apply with peculiar force. Teachers are rarely successful in making more than one half of their scholars understand it to any useful purpose. And in this state, where schools are supported by a public fund of more than one million of dollars, and where the teachers are equal to any others, it demands so much time and attention to teach it, that in some districts the committees expressly forbid the instructor to attempt it at all.

The importance therefore of simplifying this useful study, and of bringing it down to the capacities of children, cannot be denied. How far I have succeeded in an attempt to do this, the public must judge. All that seems necessary for me to say on this point is, that I have restricted myself to the five ground rules of arithmetic, and Reduction; under the belief that the difficul-

ties in this study have chiefly arisen from the imperfect manner in which these rules are explained in the books commonly used. If the definitions, and rules, and cases given, are all above the comprehension of the pupil, it requires extraordinary ingenuity and readiness in the teacher, to dissipate every difficulty which a dozen or twenty scholars will incessantly meet. It cannot therefore be a fault with teachers, that their pupils often proceed to the Rule of Three or Vulgar Fractions, before they perfectly comprehend all the principles of Simple Arithmetic. This, however, being the fact, lays a foundation for perpetual obstructions in pursuing the study, and for almost perfect ignorance of it at the end. I have therefore bent my efforts at tracing the first footsteps of the way, and then confide the pupil to his instructor, and such a book as he may choose.

Walter D. Woodworth's
Book
1829



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ARITHMETIC

is the art of computing numbers, and has five principal rules, called Numeration, Addition, Substraction, Multiplication, and Division.

Numbers are expressed by these figures: 1, called one; 2, two; 3, three; 4, four; 5, five; 6, six; 7, seven; 8, eight; 9, nine; and 0, called cypher.

NUMERATION

is the art of expressing the number of *units* or *ones*, signified by a horizontal line of figures.

The first right hand figure in a line means so many *units* or *ones*, the same as if it stood alone; the second signifies so many tens; the third signifies hundreds; the fourth, thousands; the fifth, tens of thousands; the sixth, hundreds of thousands; the seventh, millions; the eighth, tens of millions, &c.

The following illustration shews this at one view.

2	4	5	8	3	6	7	5	4	9
	Ninth, hundreds of millions,	Eighth, tens of millions,	Seventh, millions,	Sixth, hundreds of thousands,	Fifth, tens of thousands,	Fourth, thousands,	Third, hundreds,	Second, tens,	First, units, or ones,

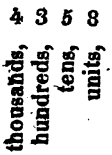
Thus it appears 458367549, signify Four hundred and fifty-eight millions, three hundred and sixty seven thousand, five hundred and forty-nine.

A *cypher* standing by itself signifies nothing, but placed after another figure increases the value of that figure ten fold. Thus, 40 signifies *forty*, or *four tens;* 60, *sixty*, or *six tens.*

EXAMPLES.

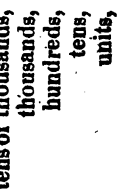
What is the number contained in 4358?

Let the scholar write the figures thus,



and it appears that 4358, signify four thousand, three hundred, and fifty-eight.

Again, what is the number meant by 58025?



It appears then that 58025, signify fifty-eight thousand and twenty-five.

Read the following numbers.

1, one.	8, eight.	15, fifteen.
2, two.	9, nine.	16, sixteen.
3, three.	10, ten.	17, seventeen.
4, four.	11, eleven.	18, eighteen.
5, five.	12, twelve.	19, nineteen.
6, six.	13, thirteen.	20, twenty.
7, seven.	14, fourteen.	30, thirty.

40, forty.
50, fifty.
60, sixty.
70, seventy.
80, eighty.
90, ninety.
100, one hundred.
1000, one thousand.
10000, ten thousand.
1000000, one million.

35, thirty-five.
46, forty-six.
57, fifty-seven.
68, sixty-eight.
75, seventy-five.
83, eighty-three.
94, ninety-four.
120, one hundred and twenty.
225 two hundred twenty five.
230 two hundred and thirty.

240, two hundred and forty.
354, three hundred and fifty-four.
1200, one thousand two hundred.
2376, two thousand three hundred and seventy-six.
5021, five thousand and twenty-one.
16034, sixteen thousand and thirty four.
856381, eight hundred and fifty-six thousand, three hundred and eighty-one.
9267169, nine million, two hundred and sixty-seven thousand, one hundred and sixty-nine.

Now let the scholar write down all these figures, and tell their meaning without looking upon the book.

To express any number in figures.

RULE.

Write the figures down as expressed in words, taking care to let units follow tens, tens follow hundreds, &c. and also remembering to fill vacancies with cyphers; that is, if after hundreds no tens are expressed, fill the place of tens with a cypher; or if after thousands, no hundreds are expressed, fill the place of hundreds with a cypher, &c.

Write fifty-six in figures.
Write one hundred and eleven.
Write two hundred and sixty three.
Write three hundred and seventy.
Write one hundred and nine.

N. B. In this instance the scholar will observe that no *tens* are expressed, and therefore the place must be filled with a cypher, thus, 109

Write one hundred and forty.

N. B. Here there are no *units*, therefore fill their place with a cypher, thus, 140.

Write one hundred and seven.

Write one hundred and sixty.

Write eight hundred and twelve.

Write one thousand six hundred and seventeen.

Write one thousand and ninety-six.

N B. Here no *hundreds* are expressed, therefore fill the place with a cypher, thus, 1096.

Write nine thousand six hundred and seventy.

Write eighteen thousand six hundred and ninety-one.

Write one thousand and one.

Write twenty thousand and sixty-three.

Write one hundred and twenty-three thousand and sixty-three.

Write seven millions eight hundred and sixty-nine thousand one hundred and ten.

ADDITION

is the process of collecting several sums into one amount which shall equal the value of such several sums.

SIMPLE ADDITION.

is the process of collecting several sums *of the same kind* into one amount.

ILLUSTRATION.

Take in one hand four pieces of paper, four cents, or four apples, and in the other hand take five. Put them together and count them; they make nine. 4 and 5 therefore make 9.

Again, take 8 in one hand and seven in the other, and how many are there in all? *Ans.* 15.

Take 10 in one hand and 3 in the other, and how many are there? *Ans.* 13.

CASE I.

Where there is but one column of figures.

RULE.

Add the bottom figure to the next above, and the next figure to the sum of those two, and so proceed till the

whole figures are added; then set down the whole amount under the sum, drawing a line between the question and the answer.

The sum to be done is the *question*, and the result is the *answer*.

PROOF.

To know if any sum in addition is right, begin at the top, and carefully add the sum downwards; and if the result is the same as before, it is supposed to be right.

EXAMPLES.

Add together 3, 4, and 5.

	3
	4
	5
Ans.	12
Proof.	12

Say 5 and 4 are 9—9 and 3 are 12—set twelve down and draw a line under it. Now to prove the sum, begin at the top and say 3 and 4 are 7—7 and 5 are 12. As this is equal to the other sum, the work is right.

Add 9, 7, and 6.

	9
	7
	6
Ans.	22
Proof	22

Add 1, 9, and 8.

	1
	9
	8
Ans.	18
Proof	18

5	4	6	9	8	4
4	2	4	8	6	6
2	8	2	1	4	3
6	1	5	2	5	2
1	3	4	3	1	1
3	4	2	4	3	8
4	5	8	5	8	4
Ans. 25	27	31			
Proof 25	27	31			

CASE II.

Where there is more than one column.

RULE.

Add the right hand column as in Case I. Set down what is over ten, or twenty, or thirty, or forty, &c. and carry to the next column, one for ten, two for twenty, three for thirty, four for forty, &c. Then add the next column in the same way, adding what is brought from the other column; proceed in this manner through the sum, and under the last column set down the whole amount of that column.

Proof—as in Case I.

EXAMPLES.

	9 8 9 2	The first column amounts to 16.
	3 7 8 9	As this is 6 over *ten* set down 6 and
	2 4 6 5	carry one to the next column.
Ans.	16 1 4 6	The second column amounts to 23, and one brought from the first column makes 24. As here
Proof	16 1 4 6	are 4 over *twenty*, set down 4 and carry 2.

The third column amounts to 19, and 2 are 21.—Set down 1 and carry 2.

The fourth column amounts to 16. Set down the whole.

	3 8 6 1 7	3 4 9 6 3	5 2 6 1 2
	5 7 2 8 1	6 8 2 4 4	9 3 4 7 5
	3 9 1 7 1	3 9 1 0 2	8 0 2 1 1
Ans.	13 5 0 6 9	14 2 3 0 9	22 6 2 9 8
Proof	13 5 0 6 9	14 2 3 0 9	22 6 2 9 8
	4 2 6 8 3	4 6 3 7 3	9 0 7 6 9
	8 9 1 2 3	5 4 2 1 4	7 2 1 8 6
	8 7 9 3 4	6 8 1 2 4	9 2 1 6 4
Ans.			
Proof			

3 8 1 2 4 6 3 7 1		6 2 8 1 4 5 7 2 4
4 0 2 1 7 0 6 9 2		2 1 0 9 4 8 3 6 8
7 2 6 1 9 0 4 3 8		3 8 7 6 8 1 3 5 7
2 8 0 9 1 2 0 0 0		1 0 0 8 0 0 0 0 4
Ans. 17 9 0 5 1 9 5 0 1		
Proof 17 9 0 5 1 9 5 0 1		

2 0 2 1	2 6 1 9 0	4 7 2 6 9 0 1
3 4 6 8 1	3 0 8 0	1 3 4 5 6 4
3 4 2 8	2 8 8	1 0 9 2 1
6 1 7 6 0 0	6 3 3	7 2 3 4
1 0 0	1 1	7 2 1
9 0 8 1	9 2 0 1 0	9 9
Ans. 6 6 6 9 1 1	12 2 2 1 2	4 8 8 0 4 4 0
Proof 6 6 6 9 1 1	12 2 2 1 2	4 8 8 0 4 4 0

6 4 2 0 3 4	4 3 8 9 2 7	3 4 8 1 9 0 4 3
3 6 2 1 5	1 8 4	2 8 1 9 7 2 1 9 6
4 2 1 3	3 1	3 8 1 3 6 9 2 1 5 4
1 0 0	8	8 6 3 6 1 0 2 1 0
8 0	7 2	9 0 2 4 6 9 2 8 1
4 6 8	9 4 2	9 4 3 8 6 3
3 4 1 2	6 8 1 3	7 6 4 2 1
Ans.		
Proof		

Add four thousand and twenty-one; three hundred and eighty-three; and fifteen hundred together.

	4 0 2 1
	3 8 3
	1 5 0 0
Ans.	5 9 0 4
Proof	5 9 0 4

Add together 3726942 and 783156 and 6823.

3726942
783156
6823

Ans. 4516921

Proof 4516921

Add together seventy-three thousand one hundred and seventy; four thousand six hundred and eighty; nine hundred and seventy-nine; and eight hundred. *Ans.* 79629.

Add together eighteen millions, one hundred and ninety-nine thousand, seven hundred and ninety-nine; forty-four thousand, six hundred and eleven; and one million, seven hundred and fifty-five thousand, five hundred and ninety. *Ans.* 20000000.

Add together one million, seven hundred and twenty-thousand, nine hundred and ninety-nine; forty thousand and seventy; sixty-seven thousand, four hundred and sixty; and eight millions, one hundred and seventy-one thousand four hundred and seventy. *Ans.* 9999999.

Add together, 8635, 360, 4608, 90042, 3761581. *Ans.* 3865226.

Add 102, 3415, 67134, 8219, 346, 20, 10, 11, 8. *Ans.* 79265.

Add 348691, 28139, 1021, 42, 876912. *Ans.* 1254805.

PRACTICAL QUESTIONS.

In travelling, my expenses were, the first day, two dollars; the next day, three dollars; the next day, two dollars; the next day, four dollars; the next, five dollars; and the next, two dollars. What was the whole expense? *Ans.* 18 dollars.

A hunting party killed four deer, three bears, eleven foxes, one hundred and fifty-seven squirrels, and eighty-eight rabbits. How many animals did they kill in all? *Ans.* 263 animals.

In going a journey, a man travelled on horseback 47 miles, in the stage 611 miles, in steam boats 211, and on foot 80 miles. How far did this man go? *Ans.* 949 miles.

If one man owes me 1817 dollars, another 483, another 1687, another 589, another 3875, another 391, another

87, another 984, and another 73; how much do they all owe me? *Ans.* 10426 dollars.

The distance from Portland to Boston is 125 miles, from Boston to Hartford 100 miles, from Hartford to New Haven 34 miles, from New Haven to New York 80 miles. Now what is the distance from Portland to New York?

Ans. 339 miles.

Henry had read 120 pages in one week, 213 in another, 75 in another, 82 in another, 301 in another, and 76 in another. Now Henry said he had read in these six weeks 847 pages, and James said he had read but 747; but how many had he read? *Ans.*

SUBTRACTION

is the process of taking one number from a larger, thereby shewing the difference between the two numbers.

SIMPLE SUBTRACTION

is the process of taking one sum from another of the *same kind.*

ILLUSTRATION.

Take in the hand nine cents; then take five of them out, and four are left; *5* from 9 therefore, leave 4.

Take 3 from 5
Take 5 from 6
Take 7 from 9
Take 6 from 11

CASE I.

Where the lower figures are all less than the upper ones.

RULE.

Place the smallest sum under the other; units under units, tens under tens, &c. Begin at the right hand and take the lower figure from the upper, and place the difference below; proceed in this manner with all the figures.

Proof. Add the lower line of the question and the difference together, and if equal to the upper sum, the work is right.

EXAMPLES.

From	7 6 4 3 8 2
Take	3 4 1 2 4 1
Difference	4 2 3 1 4 1
Proof	7 6 4 3 8 2

Begin at the right hand, and say 1 from 2 leaves 1; set down 1, and proceed to the next;—4 from 8 leave 4, set down 4; 2 from 3 leave 1, set down 1; 1 from 4 leave three, set down 3; 4 from 6 leave 2, set down 2; 3 from 7 leave 4, set down 4.

To prove the work—1 and 1 are 2, 4 and 4 are 8, 2 and 1 are 3, 3 and 1 are 4, 4 and 2 are 6, 4 and 3 are 7. Thus it appears that the difference between 764382 and 341241 is 423141.

	6 8 2 3 1 5	3 8 2 1 7 0 6
	3 4 1 2 0 3	2 1 1 0 6 0 3
Difference	3 4 1 1 1 2	
Proof	6 8 2 3 1 5	

CASE II.

Where the lower figure is larger than the upper.

RULE.

Place the sum as in case 1, and where the lower figure is larger than the one above it, add 10 to the upper figure and take the lower figure from that sum; set down the difference as in case 1, and proceed, adding *one* to the next lowest figure.

Proof, as in case 1.

EXAMPLES.

From	5 6 7
Take	2 7 8
Difference	2 8 9
Proof	5 6 7

Begin with 8, and as it is more than the figure above it, add 10; well, 10 and 7 are 17—8 from 17 leave 9, set down 9; add 1 to 7 and it makes 8—we cannot take 8 from 6, therefore add 10 to the 6 and take 8 from 16—8 are left; set it down. Add 1 to 2, and take 7 from 5, and 2 remain; set it down.

Thus it appears the difference between 567 and 278, is 289.

From	3 7 6 2 3 1	2 8 7 6 0 4
Take	2 8 1 5 6 8	1 8 6 9 9 9
Difference	9 4 6 6 3	1 0 0 6 0 5
Proof	3 7 6 2 3 1	2 8 7 6 0 4
From	4 0 6 8 2 1 7	9 8 2 1 8 3
Take	2 0 8 3 9 1 2	9 7 1 1 7 9
Difference	1 9 8 4 3 0 5	
Proof		
From	4 6 8 3 2 1 7	8 6 4 2 7 1 8
Take	3 9 0 2 1 5 7	6 9 2 1 5 6 4
Difference		
Proof		
From	13472698217432	972682154321
Take	12360348921763	769042038615
Difference		
Proof		

Take seven hundred and thirty one thousand seven hundred and eleven, from one million three hundred and ninety six thousand seven hundred and ninety two.

Ans. 665081.

Take nine millions six hundred and seventy thousand nine hundred and twenty-two, from ten millions.

Ans. 329078.

Take one from seven millions. *Ans.* 6999999.

Take forty two thousand three hundred and seventy-five, from one hundred and sixteen millions six hundred and sixty one thousand nine hundred. *Ans.* 116619525.

Take 937691 from 1083467. *Ans.* 145776.

Take 8000041 from 97000000. *Ans.* 16999959.

Take 4786421 from 9468432. *Ans.* 4682011.

Take 6577361 from 7829032. *Ans.* 1251671.

PRACTICAL QUESTIONS.

One man has 6730 dollars, and another has 6729, how many dollars has the first, more than the other?

Ans. 1 dollar.

One man being 84 years old, and another 65, what is the difference of their ages? *Ans.* 19 years.

One man was born in the year 1775, another in the year 1800; how much older is one than the other?

Ans. 25 years.

On a journey of 145 miles, and having travelled 74, how many miles have I still to go? *Ans.* 71 miles.

If I bought a farm for 11300 dollars, and sold it for 12000, what was my profit? *Ans.* 700 dollars.

Henry learnt 470 pages, and James 390; how many had Henry learnt more than James? *Ans.* 80.

MULTIPLICATION

is a short process of adding several equal sums into one amount.

The sum to be multiplied is called the *multiplicand*; the sum by which you multiply is called the *multiplier*; the result of the multiplication is called the *product*.

SIMPLE MULTIPLICATION

is the process of collecting several equal sums of the *same kind* into one amount.

ILLUSTRATION.

Take three parcels of cents of four each, put them all into one pile and count them, they make 12; 3 times 4 therefore (or what is the same thing, 4 and 4 and 4) are equal to 12.

Multiply 5 by 4. Here take 5 piles of cents of 4 each and count them, they make 20; 5 multiplied by 4 therefore make 20.

Multiply 6 by 3.
Multiply 7 by 2.
Multiply 3 by 6.

Let the scholar now learn the following *multiplication table*, which is thus used. Multiply the top row of figures by each figure in the left hand column. The product will be found on a line with the multiplier, and exactly under the figure which is multiplied.

MULTIPLICATION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

CASE I.

Where the multiplier is not more than 12.

RULE.

Place the multiplier under the multiplicand, units under units, tens under tens, &c. Multiply each figure in the multiplicand by the multiplier, and set so much of the product as is over ten, twenty, thirty, &c. under the figure multiplied, and add to the product of the next figure one for ten, two for twenty, three for thirty, &c.

PROOF. To know if the work is right, take one from the multiplier, and multiply by the sum remaining; then

add the multiplicand to the product, and if the sum is equal to the first product, the work is right.

EXAMPLES.

Multiplicand,	217	Say, nine times 7 are 63—set
Multiplier,	9	down 3 and carry 6.—Nine times
		1 are 9, and 6 brought from the
Product,	1953	other figure are 15—set down 5
		and carry 1. 9 times 2 are 18
		and 1 are 19—set it down.

Proof

Multiplicand, 217

8—the multiplier after deducting 1.

1736

217 add the multiplicand

1953 being equal to the other product, proves the work correct.

It appears therefore that 217 multiplied by 9 are [illegible]

Multiplicand,	183	374	862	921	862
Multiplier,	2	3	4	5	6
Product,	366	1122	3448	4605	5172
Proof,					

873	923	608	724	923
7	8	9	11	12
6111	7384	5472	7964	

CASE II.

Where the multiplier is more than 12.

RULE.

Write the sum as before, units under units, tens under tens, &c. Begin with the right hand figure in the multiplier, and multiply each figure in the multiplicand, as in Case I. Then multiply by the next figure in the multi-

ier, taking care to set the first figure in the product xactly under the figure used in multiplying. Proceed this manner through all the figures in the multiplier, d then add up the several products into one sum. his sum is the answer.

Proof as in Case I.

EXAMPLES.

Multiplicand,	2786	Multiply 2786 by 3, and the
Multiplier,	23	product is 8358—set this down
		as in Case I. Then multiply
	8358	by 2, and set the first figure in
	5572	the product which is 2, under
Ans.	64078	the figure 2 by which you multiply. Then proceed to multiply the rest. Now add up these two lines into one sum, and you have 64078 for answer.

Now to see if the above operation is correct, let us ke 1 from the multiplier, and proceed as in Case I.

Multiplicand,	2786	Take 1 from 23 and we
Multiplier,	22	have 22.—Multiply by 22, and
		the product is 61292—now add
	5572	the multiplicand to this sum,
	5572	and we have 64078, which be-
Product,	61292	ing the same as above, proves
	2786	the work correct. —the multiplicand
Ans.	64078	

hus it appears 2786 multiplied by 23 are equal to 64078.

Multiplicand,	380246	*Multiplicand,*	286342.
Multiplier,	382	*Multiplier,*	309
	760492		2577078
	3041968		8590260
	1140738		
		Ans.	88479678
	145253972		

	Proof		Proof
Multiplicand,	380246	*Multiplicand,*	286342
Multiplier,	381	*Multiplier*	308
	380246		2290736
	3041968		8590260
	1140738		
	144873726		88193336
	380246		286342
Ans.	145253972	*Ans.*	88479678
	27364	82634	3726804
	56	94	180
Ans.			
Proof			

CASE III.

Where the multiplier is 10, 100, 1000, 10,000, &c.

RULE.

Annex as many cyphers to the right hand of the multiplicand as there are cyphers in the multiplier, and that sum is the answer.

Multiply 483 by 10. *Ans.* 4830.
Multiply 6742 by 100. *Ans.* 674200.
Multiply 54682 by 1000. *Ans.* 54682000.
Multiply 8324167 by 10,000. *Ans.*

Multiply 5642 by 47. *Ans.* 265174.
6823 by 80. *Ans.* 545840.
83460 by 137. *Ans.* 11434020.
97642 by 208. *Ans.* 20309536.
672473 by 340. *Ans.* 228640820.
367043 by 200. *Ans.* 73408600.
693672 by 1203. *Ans.* 83448741[illegible].
837268 by 1080. *Ans.* 904249440.
304267 by 3801. *Ans.* 11565[illegible].
682710 by 1000. *Ans.* 682710000.

PRACTICAL QUESTIONS.

It is 114 miles from Hartford to New-York. How many miles, therefore, has a man travelled, who has been from one place to the other 13 times? *Ans.* 1482 miles.

If a man receives 162 cents for one day's labour, how many should he receive for 365 days' labour?

Ans. 59130 cents.

If a ship sails at the rate of 98 miles in a day, how many miles will she sail in 120 days?

Ans. 11760 miles.

If 320 rods make 1 mile, how many rods are there in 4378 miles? *Ans.* 1400960 rods.

If a person spends 1237 dollars in one year, how much will he spend in 10 years? *Ans.* 12370 dollars.

If a person receives 3600 cents each day, for 972 days, how many cents does he receive in the whole time?

Ans. 3499200 cents.

Henry learnt 516 lines a week, for 27 weeks. He and James desire to know how many he has learnt in all.

Ans. 13932 lines.

DIVISION

is that process by which we find how many times one number is contained in another.

The sum to be divided is called the *dividend.*

The sum by which we divide is called the *divisor.*

The result is called the *quotient.*

SIMPLE DIVISION

is the process of finding how many times one number is contained in another *of the same kind.*

ILLUSTRATION.

Take in the hand 9 cents—count them out into parcels of two each. There are 4 parcels, and one over. It appears, therefore, there are in 9, 4 times 2, and 1 over.

Divide 11 by 3.—Here count out 11 cents, and then count them into parcels of 3 each—we find 3 parcels, and 2 over. There are, therefore, 3 times 3 and 2 over, in 11.

Divide 12 by 4.

RULE.

Draw a perpendicular line at each end of the dividend; and place the divisor at the left hand. Then take one or more left hand figures in the dividend which make a larger number than the divisor, and consider how many times the divisor is contained in such figures.—Set down the greatest number of times so contained, on the right hand of the dividend for a quotient; multiply the divisor by this quotient and set the product under the figure or figures in the dividend which contained the quotient. Subtract this product, and annex to the right hand of it the figure in the dividend next to those used. If the sum thus obtained is not as large as the divisor, put a cypher in the quotient, and bring down the next figure. But, as soon as your sum is larger than the divisor, find how many times the divisor is contained in it, and put down the number of times for a quotient. Multiply the divisor as before, and proceed in the same manner till all the figures in the dividend are brought down. What is left is called the remainder; and the quotient shews how many times the divisor is contained in the dividend.

PROOF.—Multiply the quotient by the divisor, and add the remainder. If the product is equal to the dividend, the work is right.

EXAMPLES.

Divide 815 by 3	*Div. Quo.*
Divis. 3	)815(271
	6
Proof.	——
271 *Quo.*	21
3 *Divis.*	21
——	——
813	5
Rem. 2	3
——	——
815	2 *Rem.*

Consider how many times 3 there are in 8.—Try twice; set down 2 for quotient, and multiply the divisor by it; place the product 6 under the 8 and subtract it—2 are left; bring down the next figure in the dividend which is 1.—In 21 there are 7 times 3. Multiply by 7, and as the sums are even, bring down the 5 in the dividend.—There is once 3 in 5, and 2 remainder.

being equal to the dividend, proves the work correct.

It appears therefore that in 815 there are 271 times 3 and 2 over.

Div. Quotient.
Divisor, 9)8272(919
81
—
17
9
—
82
81
—
Remainder. 1

Proof
919 *Quotient*
9 *Divisor*
—
8271
Add 1 *Rem.*
—
8272 *being equal to the dividend, proves the work correct.*

In this case the 8 being less than the divisor, we take two figures; that is 82. How many times 9 then in 82? Let us set 9 on the right hand of the dividend, and multiply the divisor by it, setting the product under the figures used in the dividend. Subtract 81 from 82, and 1 is left. Bring the 7 in the dividend down to the 1, and we have 17. Well, how many times 9 in 17? Try 1. Once 9 is 9—set 9 under the 17 and subtract it; 8 are left. Bring the 2 in the dividend down to the 8, and we have 82. How many times 9 in 82? Try 9 times.—9 times 9 are 81.—Put down 81 and subtract it from 82—one is left. It appears therefore you have 919 for quotient, and 1 for remainder.

It appears therefore, that 8272 divided by 9 gives 919 and 1 over, that is one ninth.

3)842(280 *Quotient*, and 2 *Remainder*, or $\frac{2}{3}$ two thirds.
8)10763(1345 *Quotient*, and 3 *over*, or $\frac{3}{8}$ three eighths.
7)916521(130931 *Quotient*, and 4 *over*, or $\frac{4}{7}$ four sevenths.
17)8638276(508133 *Quo* and 15 *over*, or $\frac{15}{17}$ fifteen seventeenths.
48)6027421(125571 *Quo.* and 13 *over*, or $\frac{13}{48}$ thirteen forty eighths.
60)4831072(80517 *Quo.* and 52 *over*, or $\frac{52}{60}$ fifty-two sixtieths.
112)8207638(73282 *Quo.* and fifty-four *over*, or $\frac{54}{112}$ fifty-four one hundred and twelfths.
[illegible]021780(8619 *Quo.* and 723 *over.*

1637)97426830(59515 *Quo.* and 775 *over*, or $\frac{775}{1637}$.
98215)10786421324(11203 *Quo.* and 4939 *over*, or $\frac{4939}{98215}$.

N. B. When the divisor is 10, 100, 1000, 10,000, &c. cut off as many figures on the right hand of the dividend as there are cyphers in the divisor, for a remainder; and the left hand figures are the quotient—thus,

Divide 826347 by 100.

8263 *Quotient*, and 47 *Remainder*.

Divide 187638 by 10. *Ans.* 18763 *Quo.* and 8 *over*.

Divide 997231 by 1000. *Ans.* 997 *Quo.* and 231 *over*.

Divide 8648321 by 10000. *Ans.* 864, and 8321 *over*.

PRACTICAL QUESTIONS.

Four boys have gathered 56 bushels of walnuts. In dividing them equally, how many does each have?

Ans. 14. bushels each.

If a person is to travel 588 miles in 12 days, how many must he travel each day? *Ans.* 49 miles.

If government is to divide 42000 dollars among 300 sailors, how many dollars will each have?

Ans. 140 dollars each.

If a vessel sailed around the world, calling it 25000 miles in 365 days, how many miles did she go each day?

Ans. 68 miles, and one hundred and eighty, three hundred and sixty-fifths.

If a person's expences are 730 dollars a year, how much is that each day—calling the year 365 days?

Ans. 2 dollars each day.

On dividing equally a capital of 27000 dollars between three partners, how much has each?

Ans. 9000 dollars each.

James has learnt to spell 714 words in 56 days, how many is that each day? *Ans.* 12 words and $\frac{42}{56}$ each day.

Questions to exercise the foregoing Rules.

What is the cost of 15 tons of hay at 15 dollars a ton? *Ans.* 225 dollars.

What number multiplied by 9 will produce 225? *Ans.* 25.

The quotient of a certain number is 457 and the divisor is 8. What is the dividend? *Ans.* 3656.

Bought 50 horses for shipping at 37 dollars each; what do they come to? *Ans.* 1850.

A man carried grain to market which produced 372 dollars; cloth which produced 117 dollars; meat which produced 172 dollars; and his expenses were 38 dollars. How much money had he left? *Ans.* 623 dollars.

Three persons labouring together earned 1788 dollars, and after paying their expenses, which amounted to 864 dollars, divided the balance equally. How much had each? *Ans.* 303 dollars.

What is the amount of the following Bill?

James Jay,

Bought of Lemuel Paywell.

3 pounds Indigo, at 2 dollars per pound,	$6
8 yards Cloth, at 8 dollars per yard,	64
37 packs Pins, at 1 dollar per pack,	37
50 gallons Brandy, at 2 dollars per gallon,	100
Ans.	$207

What is the amount of the following bill?

Julius Jones,

Bought of Abraham Johnson.

91 yards of Lace, at 3 dollars,	273
18 pounds Indigo, at 2 dollars,	36
216 gallons Wine, at 4 dollars,	864
104 yards Cloth, at 3 dollars,	312
16 pieces Nankin, at 2 dollars,	32
Ans.	$1517

A man died, and left to one child 787 dollars; to another, 863 dollars; to another, four times as much as to the first. How much was the whole amount of this property? and how much was the portion of the last child? *Ans.* whole property, 4798 dollars; portion of the last child, 3148 dollars.

A man left an estate thus situated: 3 farms, worth 1500 dollars each; notes of hand, 2800 dollars; ready money, 6008 dollars; bank stock, 1616 dollars; and other personal estate, 1821 dollars. All this property was equally divided among seven heirs, after paying

debts to the amount of 4621 dollars. Now what was the whole amount of the estate after paying said debts? and what was the share of each heir? *Ans.* whole property 12124 dollars and the portion of each heir 1732 dollars.

The scholar will remember, that the foregoing rules are the basis of Arithmetic; and all that is now to be learnt is nothing more than *how* and *when* to use simple Addition, Subtraction, Multiplication, and Division. To prevent the necessity of repetition, therefore, it will be well to have it remarked here, that to prove the correctness of any arithmetical operation, the same methods may be adopted as in the foregoing rules.

FEDERAL MONEY

being the coin of the United States, I shall introduce it here. Its denominations are, Eagles, Dollars, Dimes, Cents, and Mills. 10 mills make 1 cent, 10 cents make 1 dime, 10 dimes make 1 dollar, 10 dollars make 1 eagle. But as all practical computations employ none but the following, these only will be noticed.

10 mills make 1 cent,
100 cents make one dollar.

This can be illustrated by the coin itself.—One cent is worth 10 mills.—1 dollar is worth 100 cents.

This mark $ placed before a sum, shews it to be dollars.

ADDITION OF FEDERAL MONEY.

RULE.

Place dollars under dollars, cents under cents, and mills under mills, separating dollars from cents by periods. Then add the whole sum precisely as in simple addition, without any regard to the separations. Then place a period in the sum total exactly under the periods in the question. All the figures to the left of the period are dollars; the two first figures to the right are cents, and the next figure is mills. If the cents in any sum are less than 10, put a cypher before the figure;

EXAMPLES.

Add 317 dollars, 20 cents, and 9 mills,—613 dollars, cents, and 4 mills,—and 8 dollars, 69 cents, and 2 mills.

317 . 20 9
613 . 08 4
8 . 69 2

Ans. $938 . 98 5 that is 938 dollars, 98 cents, and 5 mills.

436 . 07 1	500 . 00 0	3842 . 71 5
63 . 08 3	36 . 82 1	1082 . 13 8
1 . 89 6	17 . 63 4	1056 . 00 8
177 . 86 0	82619 . 34 8	372 . 06 9
Ans. $678 . 91 0	83173.803	6352.93.0

PRACTICAL QUESTIONS.

One man owes me 127 dollars, 9 cents, and 5 mills; another 763 dollars; another 150 dollars, 50 cents, and mills. How much do they all owe me?

Ans. $1040 . 60 0

A merchant presented me a bill for cloth of one kind, 20 dollars 50 cents; of another, 87 dollars 62 cents mills; of another, 716 dollars 37 cents and 5 mills. What was the amount of this bill?

Ans. $1024 . 50

A man purchased one ox at 47 dollars and fifty cents; nother at 63 dollars; another at 87 dollars and fifty ents, five mills; another at 88 dollars. What was the ost of the whole? *Ans.* $286 . 00 5

SUBTRACTION OF FEDERAL MONEY.

RULE.

Write the smallest sum under the larger—dollars under dollars, cents under cents, &c.; and proceed as in Simple Addition, placing the periods in the *difference* exactly under those in the *question*. Remember also, if the cents are less than 10, to place a cypher before the

What is the cost of 1517 pounds sugar, at 13 cent 5 mills, per pound? *Ans.* $204.79 5

What is the expense of a manufactory in 30 days, 1 $43.28 per day? *Ans.* $1298.40

How much will 27 tons of Plaster of Paris amount t at $9.37 5 per ton? *Ans.* 253.12 5

How much will 375 yds. Nankin come to at 37 cent 5 mills per yard? *Ans.* $140.62 5

What must be paid to an army of 33813 men, if eac man is to receive $13.87 5? *Ans.* $469155.37 5

What will 38 gallons wine come to at $4.12 per ga lon? *Ans.* $ 156.56

What will 9313 yds. cambrick come to at 41 cts. pe yard? *Ans.* $ 3818.33

DIVISION OF FEDERAL MONEY.

RULE.

Write the sum as in Simple Division; and if there are are no cents or mills in the dividend, fill up their places with cyphers. Then proceed as in Simple Division, and point off the three right hand figures in the quotient for mills and cents; and the rest are dollars.

Divide 326 dollars 8 cents 7 mills by 31.

31)326.08 7(10.51 8 *Quotient.*
31

160
155

58
31

277
248

29 *Remainder.*

The answer then is 10 dollars, 51 cents, 8 mills, and

Divide 3471 dollars and 5 mills by 18.

18)3471 . 00 5(192 . 83 3 *Quotient.*
18
167
162
51
36
150
144
60
54
65
54
Remainder 11

Answer, 192 dollars, 83 cents, 3 mills, and $\frac{11}{18}$

Divide $7638 . 20 8 by 46. *Ans.* $166 . 04 8
10083 . 16 by 380 *Ans.* $26 . 53 4 and $\frac{240}{380}$
256841 . 18 3 by 763. *Ans.* $336 . 20 $\frac{623}{763}$

PRACTICAL QUESTIONS.

If you divide $314671 . 37 5 between 65 sailors, how much has each? *Ans.* $4844 . 09 $8\frac{5}{65}$

If the whole expenses of a ship for 360 days are $11754 . 18 how much is that each day?
Ans. $32 . 65 $0\frac{180}{360}$

If a manufactory produces goods to the amount of $113672 . 87 5 a year, how much is that per day, calling the year 365 days? *Ans.* $311 . 43 2 $\frac{215}{365}$

If a company of 7 persons draw a prize in a lottery worth $37368 . 88, what is the portion of each individual? *Ans.* $5338 41 $1\frac{3}{7}$

If 63 persons own a tract of land worth $76890 . 08 what is the right of each person worth?
Ans. $1220 . 47 $\frac{47}{63}$

Miscellaneous questions in Federal Money.

If I have bought of a man 3 yards of cloth at $3 . 50 5 yards at $7 . 21 ; and 120 yards at $3 . 75 ; what i the amount? *Ans.* $496 . 55

I owe a man for 37 days work at $1 . 37 5 per day and I have paid him $21. How much do I still ow him? *Ans.* $29 . 87 ½

If a manufactory produces merchandise to the value o $49 . 50 per day for 90 days, and expends $33 . 13 pe day for the same period, what is the profit of said manu factory during said 90 days? *Ans.* $1473 . 30

If 7 persons are engaged in a concern which produce $37306 . 57 in a year, what is the share of each indi vidual per day? *Ans.* $14 . 62$\frac{06}{365}$

If I owe a man for 387 yards of cloth at $3 . 87 5 an he owes me for 313 bushels rye at 92 cents, and 113 bushels oats at 31 cents and 3 mills; what is the differ ence between the accounts? *Ans.* $857 . 62

FRACTIONS.

The following short treatise on Fractions may be *use ful* in some of the succeeding compound rules, and will be *necessary* in Reduction. It therefore seems proper to introduce it here; at the same time, the instructor, if he pleases, can direct the scholar to omit it.

Besides whole numbers, such as as 1, 2, 3, &c., there are *Fractions*, or parts of numbers, such as halves, quarters, &c. A half is thus expressed, ½; quarters are thus expressed, as ¼ one quarter; ¾ three quarters, &c.

ILLUSTRATION.

Take a piece of paper and call it 1, or a whole number. Cut it in two, and each piece will represent a fraction, or part of a number. Thus, 1 equally divided into 2 parts makes two halves; and 1 divided into four equal parts makes four quarters.

Thus it appears one whole number is four times as much as a quarter, and twice as much as a half.

To add quarters and halves together, we need only add how many quarters there are, and divide them by 4.

Thus, what is the amount of ½ ¾ ¼ and ¾?

½ call the ½ two quarters, and
¾ in all there are 9 quarters,
¼ which divided by 4 make 2
¾ whole numbers and ¼ over.

4)9 *quarters*

Ans. 2 *whole numbers and* ¼ *over.*

Where whole numbers joined with fractions are to be added together, reduce the fractions to whole numbers as above, and carry them to the other whole numbers.

Thus, add 8½ 3¾ and 4¼ together.

8½ call the half 2 quarters, and all the
3¾ quarters are 6—which divided by
4¼ 4 gives 1 and 2 quarters or ½—
carry the 1 to the whole numbers,
Ans. 16½ and add them together.

To subtract halves and quarters, call ½ two, and each quarter one, and proceed as in whole numbers.

Thus, take ½ from ¾

¾ call the ½ two, and take it from
½ the three quarters, and ¼ is left.

Ans. ¼

To subtract mixt numbers, (that is, whole numbers joined with fractions,) proceed with the fractions as above, and with the whole numbers as in Simple Subtraction; unless the lower fraction should be more than the upper, in which case take the lower fraction from one whole number and add to the product the upper fraction. Then subtract the whole numbers, adding 1 to the lower figure.

Miscellaneous questions in Federal Money.

If I have bought of a man 3 yards of cloth at $3 . 50 5 yards at $7 . 21 ; and 120 yards at $3 . 75 ; what is the amount? *Ans.* $496 . 55

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If a manufactory produces merchandise to the value of $49 . 50 per day for 90 days, and expends $33 . 13 per day for the same period, what is the profit of said manufactory during said 90 days? *Ans.* $1473 . 30

If 7 persons are engaged in a concern which produces $37306 . 57 in a year, what is the share of each individual per day? *Ans.* $1 . 02$\frac{206}{365}$

If I owe a man for 387 yards of cloth at $3 . 87 5 and he owes me for 313 bushels rye at 92 cents, and 1134 bushels oats at 31 cents and 3 mills; what is the difference between the accounts? *Ans.* $857 . 62

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The following short treatise on Fractions may be *useful* in some of the succeeding compound rules, and will be *necessary* in Reduction. It therefore seems proper to introduce it here; at the same time, the instructor, if he pleases, can direct the scholar to omit it.

Besides whole numbers, such as as 1, 2, 3, &c., there are *Fractions*, or parts of numbers, such as halves, quarters, &c. A half is thus expressed, ½; quarters are thus expressed, as ¼ one quarter; ¾ three quarters, &c.

ILLUSTRATION.

Take a piece of paper and call it 1, or a whole number. Cut it in two, and each piece will represent a fraction, or part of a number. Thus, 1 equally divided into 2 parts makes two halves; and 1 divided into four equal parts makes four quarters.

Thus it appears one whole number is four times as much as a quarter, and twice as much as a half.

To add quarters and halves together, we need only ad how many quarters there are, and divide them by 4.

Thus, what is the amount of ½ ¾ ¼ and ¾?

½ call the ½ two quarters, and
¾ in all there are 9 quarters,
¼ which divided by 4 make 2
¾ whole numbers and ¼ over.

4)9 *quarters*

Ans. 2 *whole numbers and* ¼ *over.*

Where whole numbers joined with fractions are to be added together, reduce the fractions to whole numbers as above, and carry them to the other whole numbers.

Thus, add 8½ 3¾ and 4¼ together.

8½ call the half 2 quarters, and all the
3¾ quarters are 6—which divided by
4¼ 4 gives 1 and 2 quarters or ½—
carry the 1 to the whole numbers,
Ans. 16½ and add them together.

To subtract halves and quarters, call ½ two, and each quarter one, and proceed as in whole numbers.

Thus, take ½ from ¾

¾ call the ½ two, and take it from
½ the three quarters, and ¼ is left.

Ans. ¼

To subtract mixt numbers, (that is, whole numbers joined with fractions,) proceed with the fractions as above, and with the whole numbers as in Simple Subtraction; unless the lower fraction should be more than the upper, in which case take the lower fraction from one whole number and add to the product the upper fraction. Then subtract the whole numbers, adding 1 to the lower figure.

Thus, take 118 ½ from 127 ¾

Upper number, 127 ¾ take ½ from ¾ leaves ¼;
Lower number, 118 ½ 118 from 127 leave 9.

Ans. 9 ¼

Take 976 ¾ from 1008 ¼

Upper number, 1008 ¼ ¾ being more than ¼, say ¾ from
Lower number, 976 ¾ 1 leave ¼, which added to the
upper ¼ make ½. Add 1 to 976
Ans. 31 ½ and take it from 1008.

To find the half of any sum, we need only divide by 2; thus, ½ of 170 is 85.

To find a quarter of any number, we need only divide by 4; or to get ¾, we need only multiply by 3 and divide by 4.—Thus, what is ¾ of 579?

579
3
4)1737 quarters

Ans. 434 and ¼ over.

To multiply by a mixt number; multiply first by the whole number, then by the fraction, and add the products together.

Thus, multiply 72 by 6 ¼

72 Multiply first by 6; then by ¼,
6 ¼ which is done by dividing 72
432 by 4. Then add the products
18 together.

Ans. 450

Multiply 38 by 7½

38 Multiply by 7; and
7½ and then by ½, which is
266 done by dividing by 2;
19 —add the products to-
Ans. 285 gether.

Multiply 8¼ by 5¾

8¼	8¼	First multiply by 5; and
3	5¾	then by ¾, which is done by
—	—	multiplying 8¼ by 3 and divi-
4)252(63	420	ding by 4; then add the quo-
24	63	tient and products together.
—	—	
12	*Ans.* 483	
12		
—		

To divide by a mixt number; reduce the divisor to quarters, and divide the dividend by those quarters; then multiply the quotient and remainder by 4, which gives the answer. If the remainder, however, after being multiplied by 4, should be more than the divisor, divide the remainder by the divisor, and add the quotient to the other quotient.

Thus divide 260 by 3¼

20	13)260(20 *Quo.*	3¼	First reduce 3¼
4	26	4	to quarters; there
—	—	—	are 13: then divide
Ans. 80	0	13 *quarters*	260 by 13 and the
			quotient is 20; —
			multiply this 20 by
			4, and we have the
			answer, 80.

Divide 546 by 6½

21	26)546(21	6½	Reduce 6½ to
4	52	4	quarters; there
—	—	—	are 26; divide
Ans. 84	26	26 *quarters,*	546 by 26, and
	26		the quotient is 21;
	—		21 multiplied by
			4 gives the an-
			swer, 84.

Divide 1085 by $8\frac{3}{4}$

	31	35)1085(31	$8\frac{3}{4}$	Reduce $8\frac{3}{4}$ to quarters; divide 1085 by 35; multiply 31 by 4, and the answer is 124.
	4	105	4	
Ans.	124	35	35 qrs.	
		35		

Divide 183 by $5\frac{1}{4}$

	8	21)183(8	$5\frac{1}{4}$	In $5\frac{1}{4}$ there are 21. Divide 183 by 21, and the quotient is 8, and 15 remainder. Multiply these by 4, and it makes $32\frac{60}{21}$—Now as 60 is more than 21, divide 60 by 21, the quotient is 2; add this to the other quotient 32 and the answer is $34\frac{8}{21}$
	4	168	4	
	32	*Rem.* 15	21	
add	$2\frac{8}{21}$	4		
Ans.	$34\frac{8}{21}$	21)60(2		
		42		
		18		

EXAMPLES.

What is the amount of three-fourths, one-fourth, one-half, one-half, one-fourth, three-fourths and one-fourth? *Ans.* $3\frac{1}{2}$

What is the amount of 8 and a half, 3 and one-fourth, 17 and three-fourths, and 9 and one fourth? *Ans.* $37\frac{3}{4}$

What is the amount of 118 and three-fourths, three-fourths, 14 and a half, one-fourth, three-fourths, and 21? *Ans.* 156

What is the difference between three-fourths, and one-fourth? *Ans.* $\frac{1}{2}$

What is the difference between 8 and a half and 6 and three-fourths? *Ans.* $1\frac{3}{4}$

Multiply 213 by one-fourth. *Ans.* $53\frac{1}{4}$

Multiply 31 by 4 and one-fourth. *Ans.* $131\frac{1}{4}$

What is three fourths of 391? *Ans.* $293\frac{1}{4}$

Divide 313 by 4 and a half. *Ans.* $69\frac{6}{13}$

Divide 298 by 6 and one-fourth. *Ans.* $47\frac{17}{25}$

Divide 848 by 11 and three-fourths. *Ans.* $72\frac{4}{47}$

TABLES OF WEIGHTS AND MEASURES.

ENGLISH MONEY.

This is divided into pounds, shillings, pence, and farthings.

4 farthings (marked *qrs.*) make	1 penny, marked	*d.*
12 pence,	1 shilling,	*s*
20 shillings,	1 pound,	£

ILLUSTRATION.

Take a piece of paper, and call it a pound. Cut it into 20 pieces, and each piece represents a shilling.

Again, take a piece of paper and call it a shilling; cut it into 12 pieces, and each piece represents a penny.

Take a piece of paper and call it a penny; cut it into 4 pieces and each piece represents a farthing.

Thus it appears that a pound is worth twenty times as much as a shilling; a shilling twelve times as much as a penny, and a penny four times as much as a farthing.

TROY WEIGHT

is used to weigh gold and silver.

24 grains (marked *gr.*) make	1 penny-weight	*pwt.*
20 penny-weights, make	1 ounce, marked	*oz.*
12 ounces make	1 pound, marked	*lb.*

This and all the following may be illustrated as above.

AVOIRDUPOIS WEIGHT

is used to weigh coarse and drossy merchandize of all kinds.

16 drams *(dr.)* make	1 ounce,	*oz.*
16 ounces,	1 pound,	*lb.*
28 pounds, 1 quarter of a hundred weight,		*qr.*
4 quarters,	1 hundred weight,	*cwt.*
20 hundred weight,	1 ton,	*T.*

APOTHECARIES WEIGHT

is used in preparing medicine.

20 grains *(gr.)* make	1 scruple,	℈
3 scruples,	1 dram,	ʒ
8 drams,	1 ounce,	℥
12 ounces,	1 pound,	℔

CLOTH MEASURE

is used to measure all cotton, woollen, and linen fabrics.

4 nails *(na.)* make	1 quarter of a yard,	*qr.*
4 quarters,	1 yard,	*yd.*
3 quarters,	1 Ell Flemish,	*E. Fl.*
5 quarters,	1 Ell English,	*E. E.*
6 quarters,	1 Ell French,	*E. Fr.*

DRY MEASURE

is used to measure grain, beans, flaxseed, salt, oats, &c.

2 pints *(pt.)* make	1 quart	*qt.*
8 quarts,	1 peck,	*pk.*
4 pecks,	1 bushel,	*bu.*

WINE MEASURE

is used to measure wine, spirits, vinegar, oil, &c.

4 gills *(gi.)* make	1 pint,	*pt.*
2 pints,	1 quart,	*qt.*
4 quarts,	1 gallon,	*gal.*
31½ gallons,	1 barrel,	*bl.*
42 gallons,	1 tierce,	*tier.*
63 gallons,	1 hogshead,	*hhd.*
2 hogsheads,	1 pipe,	*P.*
2 pipes,	1 tun,	*T.*

LONG MEASURE

is used to measure the distance from one place to another.

3 barley corns *(b. c.)* make	1 inch, marked	*in.*
12 inches,	1 foot,	*ft.*
3 feet,	1 yard,	*yd.*
5½ yards,	1 rod, pole, or perch,	*rd.*
40 rods,	1 furlong,	*fur.*
8 furlongs,	1 mile,	*m.*
3 miles,	1 league,	*leg.*
69½ statute miles,	1 degree, on the earth.	
360 degrees, the circumference of the earth.		

NOTE.——In measuring Horses, 4 inches make 1 hand. In measuring Depths, 6 feet make 1 fathom.

LAND, OR SQUARE MEASURE

is used to measure the whole surface of a thing.

144 square inches, make	1 square foot.
9 square feet,	1 square yard.
30¼ square yards, or 272¼ square feet,	1 square rod.
40 square rods,	1 square rood.
4 square roods,	1 square acre.
640 square acres,	1 square mile.

SOLID, OR CUBIC MEASURE

is used to measure the whole bulk of a thing.

1728 solid inches make	1 solid foot.
40 feet of round timber, or 50 feet of hewn timber,	1 ton, or load.
128 solid feet or 8 feet long, 4 wide, and 4 high,	1 cord of wood.

TIME MEASURE

is used to mark the progress of the Sun.

60 seconds *(S.)* make	1 minute, marked	*S. M.*
60 minutes,	1 hour,	*h.*
24 hours,	1 day,	*d.*
7 days,	1 week,	*w.*
4 weeks,	1 month,	*mo.*
13 months, 1 day and 6 hours,	1 Julian year,	*yr.*

CIRCULAR MOTION

relates to the movements of the heavenly bodies.

60 seconds (") make	1 minute,
60 minutes,	1 degree,
30 degrees,	1 sign,

12 signs, or 360 degrees, the whole great circle of the Zodiac.

COMPOUND ADDITION

is the process of collecting several sums of the same general nature, though divided into different denominations, into one sum total.

ILLUSTRATION.

The scholar will remember that four farthings make a penny—that is, that four farthings are worth as much as a penny; 12 pence are worth as much as a shilling; and 20 shillings worth as much as a pound.

Now in one hand I have 2 pence and 3 farthings, and in the other I have 3 pence and 2 farthings. How many pence have I in both hands?

In one hand there are 2 farthings, and in the other there are three farthings. In both therefore there are 5 farthings.

In one hand there are 2 pence, and in the other there are 3 pence; in both therefore there are 5 pence.

In both hands therefore there are 5 pence and 5 farthings; or, to speak more correctly, as 5 farthings make 1 penny and 1 farthing over; there are 6 pence and 1 farthing.

Again, in one hand I have 1 pound and 13 shillings; in the other, 2 pounds and 14 shillings. How much have I in both hands?

13 shillings in one hand, and 14 in the other, make 27 shillings.

1 pound in one hand, and 2 in the other, make 3 pounds: in both hands therefore there are 3 pounds and

shillings; or, as 27 shillings contain 1 pound and 7 lings, there are 4 pounds and 7 shillings.

RULE.

Write the several denominations exactly under each er. Add up the right hand column, and divide the oduct by as many as it requires to make one of the t denomination. Set down the remainder, and carry quotient to the next column. Proceed to the next, in this manner go through all the columns.

EXAMPLES.

ENGLISH MONEY.

Let the scholar turn to page 39, and learn the divisions English money by heart. Having learnt these divins, let him proceed to the examples.

In the same way as the scholar comes to the different asures, let him learn the divisions before he proceeds the examples.

Add together, 7£. 18*s*. 11*d*. 3*qrs*. and 4£. 16*s*. 5*d*. 2*qrs*.

	£.	*s*.	*d*.	*qrs*.
	7	18	11	3
	4	16	5	2
Ans.	£12	15	5	1

Farthings.—Say 3 and 2 are 5; as 4 farthings make a nny, divide 5 by 4.—There is once 4 in 5 and 1 over. t down 1, and carry 1 to the pence.

Pence.—One from the farthings and 5 are 6, and 11 e 17. Divide 17 by 12;—there is once 12 in 17 and over.—Set down 5, and carry 1 to the shillings.

Shillings.—One from the pence and 16 are 17, and are 35. Divide 35 by 20;—there is once 20 in 35 d 15 over.—Set down 15 and carry 1.

Pounds.—One from the shillings and 4 are 5, and 7 e 12.—Set down the whole.

Thus it appears the answer is 12£. 15*s*. 5*d*. 1*qr*.

Add together, 17£. 8*s*. 9*d*. 3*qrs*. and 83£. 16*s*. 10*d*. 2

	£	*s*.	*d*.	*qrs*.
	17	8	9	3
	83	16	10	2
Ans.	101	5	8	1

Divide farthings by pence by 12; and shilli by 20.

£.	*s*.	*d*.	*qr*.	£.	*s*.	*d*.	*qr*.	£.	*s*.	*d*.
45	9	8	3	103	10	5	0	762	8	3
2	0	0	0	72	6	8	2	100	0	3
371	19	6	2	7	0	3	3		7	3
Ans. 419	9	5	1	182	17	5	1	862=15=10		

£.	*s*.	*d*.	*qrs*.	£.	*s*.	*d*.	*qrs*.	£.	*s*.	*d*.
723	5	5	3	76	0	0	0	31	12	7
283	7	6	0	134	13	10	3		4	2
183	9	0	0	942	19	9	0	987	18	12
	7	2	3	782	18	7	3	99	9	9
8	11	3	2	689	9	9	0	108	8	8
6	12	8	1	388	8	8	2	87	7	7
	19	11	3	765	1	7	0	3	2	8
An. 1269	13	2	0							

One man owes me 47£. 13*s*. 11*d*. 3*qrs*; another ow me 183£. 3*s*. 5*d*.; another, 382£. 17*s*. 6*d*. 3*qrs*.; and er, 400£.; another, 76£. 11*s*. 5*d*. 2*qrs*. How much they all owe me?

	£.	*s*.	*d*.	*qrs*.
	47	13	11	2
	183	3	5	
	382	17	6	3
	400			
	76	11	5	2
Ans.	1090	6	4	3

Add together, 780£.; 311£. 17*s*. 11*d*. 3 *qrs*.; 912 16*s*. 9*d*. 2*qrs*.; 819£.; 763£.; and 11*s*. 3*d*. 1*qr*.

Ans. 11796£. 6*s*. 0*d*. 2*qrs*.

TROY WEIGHT.

The scholar will here remember that he is to turn to tables of weights and measures, at page 39, and there learn the divisions of Troy Weight, before he proceeds to the examples.

Add together 17 pounds, 11 ounces, 17 penny-weights, 3 grains; and 113 pounds, 10 ounces, 19 penny-weights, 23 grains.

	lb.	*oz.*	*pwt.*	*gr.*
	17	11	17	3
	113	10	19	23
Ans.	131	10	17	2

As 24 grains make 1 pwt. divide the grains by 24. As 20 pwts. make 1 oz. divide the pwts. by 20. As 12 oz. make one lb. divide the ounces by 12.

lb.	*oz.*	*pwt.*	*gr.*	*lb.*	*oz.*	*pwt.*	*gr.*	*lb.*	*oz.*	*pwt.*	*gr.*
313	11	19	23	17	10	11	12	133	10	19	22
10	0	8	17	813	9	18	4	62	9	10	20
621	5	17	8	31	5	4	2	18	6	2	1
72	5	6	4	3	8	1	1	99	8	9	9
73	6	14	10	32	7	6	0	8	11	16	23
s. 1091	6	6	14								

AVOIRDUNOIS WEIGHT.

T.	*cwt.*	*qr.*	*lb.*	*oz.*	*dr.*
17	18	2	23	8	13
86	13	1	10	11	16
3	2	3	17	4	15
s. 107	14	3	24	1	12

Divide drams by 16; ounces by 12; pounds by 28; quarters by 4; and hundred weight by 20.

lb.	*oz.*	*dr.*
9	11	15
8	10	8
17	7	12
2	8	11
21	2	9
s. 60	5	7

cwt.	*qr.*	*lb.*
12	3	21
1	2	16
10	1	11
1	1	15
1	2	14

T.	*cwt.*	*qr.*	*lb.*
463	15	3	27
117	16	1	23
100	17	2	1
53	8	1	11
72	2	3	

APOTHECARIES WEIGHT.

	℔	℥	ʒ	℈	gr.
	72	6	6	2	16
	13	2	7	1	4
	11	11	3	0	8
Ans.	97	9	1	1	8

Divide grains by 20; scrup by 3; drams by 8; and oun by 12.

	ʒ	℈	gr.
	6	2	19
	5	1	11
	4	0	4
	3	1	2
	2	2	8
Ans.	22	2	4

	℥	ʒ	℈	gr.
	11	6	2	18
	9	5	0	6
	7	7	1	7
	10	2	2	19
	4	1	1	8

	℔	℥	ʒ	℈
	111	9	6	1
	27	7	4	2
	63	3	2	0
	81	11	1	1
	42	9	7	2

CLOTH MEASURE.

	Yd.	*qr.*	*na.*
	213	3	2
	76	2	1
	22	1	3
Ans.	312	3	2

Yd.	*qr.*	*na.*
351	2	1
71	0	3
902	0	2

Divide nails by quarters by 4 to ma yards; by 3 to ma Ells Flemish; by 5 make Ells Engli and by 6 to make E French.

	E. Fl.	*qr.*	*na.*
	273	2	2
	162	1	3
	71	0	1
	81	2	1
	110	1	2
Ans.	699	2	1

E. E.	*qr.*	*na.*
763	4	3
28	3	1
72	2	2
116	1	0
53	6	1

E. F.	*qr.*
662	5
31	2
83	0
721	1
563	3

DRY MEASURE.

bu.	*pk.*	*qt.*	*pt.*
75	2	6	1
13	1	7	0
82	1	5	1
71	3	4	1
8	2	3	1

bu.	*pk.*	*qt.*
78	3	1
31	2	0
91	1	1
87	2	1
48	3	0

Divide pints by 2; quarts by 8; and pecks by 4.

WINE MEASURE.

T.	*hhd.*	*gal.*	*qt.*	*pt.*
13	2	60	3	1
16	1	41	1	0
72	0	4	1	1
13	3	31	2	0
82	2	62	1	1

hhd.	*gal*	*qt.*
21	61	1
33	42	0
42	33	1
71	00	1
33	10	1

Divide pints by 2; quarts by 4; gallons by 63; and hogsheads by 4.

LONG MEASURE.

Yds.	*ft.*	*in.*	*b.c.*
16	2	11	2
34	1	9	1
21	1	11	2
9	2	8	1
17	2	7	2

lea.	*m.*	*fur.*	*po.*
783	2	7	31
927	1	1	38
868	1	5	21
972	2	4	10
813	1	3	19

Divide barley-corns by 2; inches by 12; feet by 3; poles by 40; furlongs by 8; and miles by 3.

LAND OR SQUARE MEASURE.

Acres.	*roods.*	*rods.*
791	3	39
683	1	18
798	2	27
1327	3	38
357	3	13

sq. ft.	*sq. in.*
8	113
7	29
2	118
6	97
7	73

Divide square inches by 144; square feet by 9; square rods by 40; and square roods by 4.

SOLID MEASURE.

T.	*ft.*	*cords.*	*feet.*	*ft.*	*in.*
14	33	37	117	37	1381
37	24	62	119	118	987
61	9	83	29	92	763
72	30	81	72	71	1721
37	27	72	98	39	1699

Divide solid inches by 1728; feet by 128 to get cords; and by 4 if round timber, and 50 if hewn to get tons.

TIME.

Yr.	*m.*	*w.*	*da.*	*yr.*	*da.*	*h.*	*m.*	*sec.*
21	11	2	5	27	318	23	38	59
38	8	3	6	63	62	19	29	42
17	7	2	4	96	300	12	19	36
13	2	1	5	47	299	21	10	44
14	9	0	3	28	99	19	27	53

Divide seconds by 60; minutes by 60; hours by 24; days by 365 to make years, and by 7 to make weeks; weeks by 4; months by 12.

CIRCULAR MOTION.

S.	°	′	″	*S.*	°	′	″
6	19	16	16	2	28	19	72
1	23	18	13	1	18	21	18
8	29	13	10	6	17	18	48

Divide seconds by 60; minutes by 60; and degrees by 30.

PRACTICAL QUESTIONS.

If 1 dozen spoons weigh 3 lb. 5 oz. 13 pwt. and 4 grs.; another dozen 1 lb. 7 oz. and 3 grs; and another 2 lb. 10 oz.—what is the weight of the whole?

Ans. 7 lb. 10 oz. 13 pwt. 7 grs.

If one hogshead of sugar contains 11 cwt. 3 qrs. 17 lb. 10 oz. and another 13 cwt. 1 qr. 21 lb.; what is the weight of both? *Ans.* 25 cwt. 1 qr. 10 lb. 10 oz.

If one parcel of wood measures 4 cord, 113 feet, and another 16 cord, 78 feet—what does the whole measure?

Ans. 21 cord and 63 feet.

COMPOUND SUBTRACTION

s that process by which we find the difference between wo numbers of the same general nature, but divided to various denominations.

RULE.

Place the smaller amount under the larger, so that denominations of the same kind will stand exactly under each other. Begin at the right hand and take the lower sum from the upper; set down the difference and proceed to the next, and so on. If however, the lower sum in any denomination should be more than the upper, then add to the upper sum as many as make one of the next denomination, and proceed as directed before, adding 1 to the next lower sum.

EXAMPLES.

ENGLISH MOMEY.

Take £3 18*s.* 9*d.* 3*qrs.* from £13 7*s.* 8*d.* 1*qr.*

	£.	*s.*	*d.*	*qrs.*
	13	7	8	1
	3	18	9	3
Ans.	£9	8	10	2

Say 3 from 1 cannot be taken; therefore add 4 to the upper sum and it makes 5; 3 from 5 leave 2; set down 2.

One from the farthings to 9 makes 10; 10 from 8 we cannot take, so add 12 to 8; well 10 from 20 leave 10.

One from the pence to 18 makes 19; 19 from 7 we cannot take, so add 20 to the 7; 19 from 27 leave 8.

One from the shillings to 3 are 4; 4 from 13 are 9.

The difference then between £13 7*s.* 8*d.* 1*qr.* and £3 18*s.* 9*d.* 3*qrs.* is £9 8*s.* 10*d.* 2*qrs.*

£	s.	d.	£	s.	d.	£	s.	d.
37	6	11¾	173	19	8¼	663	19	7
19	3	9¼	88	0	9½	963	8	8
Ans. 18	3	2½						

I borrowed of a man £37 8*s.* 11*d.* 3*qrs.* and paid him £19 6*s.* 8*d.* 3*qrs.*—how much do I still owe him?

	£	s.	d.	qrs.
Borrowed	37	8	11	3
Returned	19	6	8	3
Ans.—now due	£18	2	3	0

From £363 17*s.* 8*d.* 1*qr.* take £361 19*s.* 7*d.* 3*qrs.*
Ans. £1 18*s.* 0*d.* 2*qrs.*

From £8397 0*s.* 11*d.* 3*qrs.* take £7381 8*s.* 10*d.* 3*qrs.*
Ans. £1015 12*s.* 1*d.*

From £31683 take £9837 11*s.* 8*d.* 2*qrs.*
Ans. £21845 8*s.* 3*d.* 2*qrs.*

What is the difference between 3*qrs.* and £100?
Ans. £99 19*s.* 11*d.* 1*qr.*

TROY WEIGHT.

	lb.	*oz.*	*pwt.*	*oz.*	*pwt.*	*gr.*	*lb.*	*oz.*	*pwt.*	*gr.*
From	20	7	19	10	12	21	113	9	13	20
Take	9	11	18	9	8	23	76	11	17	18
Differ.	10	8	1	1	3	22	36	9	16	2

lb.	*oz.*	*pwt.*	*grs.*	*lb.*	*oz.*	*pwt.*	*oz*	*pwt.*	*grs.*
383	9	0	17	31	3	16	9	6	8
179	11	12	13	24	9	7	5	17	15
Ans.									

AVOIRDUPOIS WEIGHT.

lb.	*oz.*	*dr.*	*cwt.*	*qr.*	*lb.*	*T.*	*cwt.*	*qr.*	*lb.*	*oz.*	*dr.*
32	15	13	6	3	21	515	3	1	20	4	15
11	13	15	2	2	27	213	15	3	13	9	11
An. 12	1	14									

APOTHECARIES WEIGHT.

℔	℥	ʒ	℈	*gr.*	℔	℥	ʒ	℈	*gr.*	℔	℥	ʒ	℈
27	1	7	1	19	16	8	3	2	19	21	2	6	1
13	9	7	2	17	9	11	6	1	18	18	6	1	2
An. 13	3	7	2	2									

CLOTH MEASURE.

yds.	*qr.*	*na.*	*E. E.*	*qr.*	*na.*	*E. Fl.*	*qr.*	*na.*	*E. F.*	*qr.*	*na.*
27	3	2	31	4	2	19	2	1	74	5	2
18	3	3	17	2	3	16	1	3	36	4	3
Ans. 8	3	3									

DRY MEASURE.

	bu.	*pk.*	*qt.*	*pt.*		*bu.*	*pk.*	*qt.*	*pt.*		*bu.*	*pk.*	*qt.*	*pt.*
	61	3	1	1		21	0	7	0		37	1	2	1
	58	3	6	0		19	3	7	1		29	2	7	0
Ans.	2	3	3	1										

WINE MEASURE.

	tun.	*hhd.*	*gal.*	*qt.*	*pt.*		*hhd.*	*gal.*	*qt.*	*pt.*	*tun.*	*hhd.*	*gal.*	*qt.*	*pt.*
	139	3	49	2	1		71	57	3	0	91	3	7	2	1
	78	3	62	3	0		61	49	3	1	83	1	54	1	0
An.	60	3	49	3	1										

	bl.	*gal.*	*qt.*	*pt.*		*tier.*	*gal*	*qt.*	*pt.*		*hhd.*	*gal.*	*qt.*	*pt.*	*gi.*
	21	30	3	1		71	40	3	2		31	60	3	1	2
	9	31	3	2		36	41	2	2		18	62	3	1	3

LONG MEASURE.

	yd.	*ft.*	*in.*	*b. c.*		*yd.*	*ft.*	*in.*		*le.*	*m.*	*fur.*	*po.*
	45	2	9	1		71	2	9		71	2	6	31
	37	2	11	2		38	1	11		83	0	6	38
Ans.	7	3	9	2									

LAND OR SQUARE MEASURE.

	acres	*roods*	*rods*		*sq. ft.*	*sq. in.*		*a.*	*roods*	*rods*		*sq. ft.*	*sq. in.*
	71	3	38		18	137		71	3	27		371	72
	60	0	31		16	143		36	3	38		213	140
A.	11	3	7										

SOLID MEASURE.

	t.	*ft.*	*in.*	*t.*	*ft.*	*in.*	*cords*	*ft.*	*cords*	*ft.*
	30	38	1318	38	33	1614	29	27	31	72
	18	46	1469	17	38	1721	13	113	23	109
Ans.	11	41	1577							

TIME.

	yr.	*da.*	*h.*	*m.*	*s.*	*y.*	*d.*	*h.*	*m.*	*s.*	*y.*	*mo.*	*w.*	*d.*
	437	316	17	42	31	172	318	20	40	42	33	4	3	4
	118	360	20	59	42	131	319	21	53	48	11	7	3	5
A.	318	320	20	43	49									

CIRCULAR MOTION.

	S.	°	′	″	*S.*	°	′	″	*S.*	°	′	″
	8	21	42	31	9	13	40	38	4	17	38	21
	4	29	42	48	6	28	49	17	1	18	48	28
Ans.	3	21	59	43								

PRACTICAL QUESTIONS.

A man bought plate of various kinds weighing 31 lb. 11 oz. 13 pwt. 3 grs.; and sold 17 lb. 11 oz. 11 pwt. 16 grs.—how much had he left? *Ans.* 14 lb. 0 oz. [1 pwt. 11 grs.

If we take 17 cwt. 3 qr. 13 lb. 10 oz. of sugar from 81 cwt. 2 qr. 11 oz.—how much remains?

Ans. 63 cwt. 2 qr. 15 lb. 1 oz.

If a cask holds 252 gallons, and we draw out 213 gal. 3 qts. 1 pt.—how much is left? *Ans.* 38 gal. 0 qt. 1 pt.

What is the amount of the following bill?—viz.

James Jay

Bought of *A. Johnson*,

3 gallons Wine	at	£ 1	1*s.*	8*d.*
10 cwt. Sugar		2	3	$5\frac{1}{2}$
6 lb. do.			1	$3\frac{1}{2}$
2 gallons Spirits			8	6
3 oz. Cinnamon				$7\frac{1}{2}$

Ans. £ 26 6*s.* 1*d.*

MISCELLANEOUS EXAMPLES.

Multiply 21 lb. 11 oz. 16 pwt. 12 grs. by 6.

lb.	*oz.*	*pwt.*	*grs.*
12	11	16	12
			6
Ans. 77	10	19	0

Multiply 27 lb. 11 oz. 5 pwt. 16 grs. by 3.
Ans. 83 lb. 9 oz. 17 pwts.

Multiply 16 T. 11 cwt. 3 qrs 21 lb. 11 oz. 15 dr. by 4
Ans. 66 T. 7 cwt. 3 qrs. 2 lb. 15 oz. 12 dr.

Multiply 31 ℔. 6 ℥. 5 ℥. 2 ℈. 13 gr. by 5.
Ans. 157 ℔ 9 ℥ 5 ℥ 1 ℈ 5 grs.

Multiply 113 yds. 3 qr. 2 na. by 6.—*Ans.* 683 yds. 1 qr.

Multiply 91 E.E. 4 qrs. by 7. *Ans.* 642 E.E. 3 qrs.

Multiply 100 bu. 3 pks. 6 qts. 1 pt. by 8.
Ans. 807 bu. 2 pks. 4 qts.

Multiply 15 hhds. 58 gal. 3 qts. 1 pt. 2 gi. by 9.
Ans. 143 hhds. 26 gal. 1 qt. 1 pt. 2 gi.

Multiply 19 m. 6 fur. 31 rods by 3.
Ans. 59 m. 4 fur. 13 rods.

Multiply 2 yds. 2 ft. 9 in. 1 b.c. by 4.
Ans. 11 yds. 2 ft. 1 in. 1 b.c.

Multiply 67 acres, 3 sq. roods, 37 sq. rods by 5.
Ans. 339 acres, 3 sq. roods, 25 sq. rods.

Multiply 100 cord 38 ft. 1618 inches by 6.
Ans. 601 crds. 105 ft. 1068 in.

Multiply 13 days 16 hours 27 min. 59 sec. by 7
Ans. 95 ds. 19 hrs. 15 min. 53 sec.

Multiply 3 deg. 17 min. 49 sec. by 8.
Ans. 26 deg. 22 min. 32 sec.

PRACTICAL QUESTIONS.

What is the weight of 3 chests of tea, each weighing cwt. 1 qr. 27 lb. 10 oz ?—Ans. 4 cwt. 1 qr. 26 lb 14 oz.

In 71 pieces of cloth, each measuring 27 yds. 1 qr. how many yards ? Ans. 1934 yds. 3 qrs.

How much wine in 3 casks, each holding 1 hhd 49 gal. qts. and 1 pt. ? Ans 5 hhds. 22 gal. 3 qt. 1 pt.

What is the weight of 3 doz. silver spoons, each dozen weighing 1 lb. 6 oz. 12 pwt. 3 grs. ?

Ans. 4 lb. 7 oz. 16 pwt. 9 grs.

In 13 lots, each measuring 127 acres 2 roods 31 rods, how many acres ? Ans. 1660 acres 0 roods 3 rods.

In 13 piles of wood, each containing 5 cords, 116 feet, how many cords ? Ans. 76 cords 100 feet.

COMPOUND DIVISION

is the process of finding how many times one number is contained in another of the same general nature, but divided into different denominations.

RULE.

Begin with the highest denomination, and proceed with that as in simple division; then multiply the remainder by as many as it takes of the next denomination to make one of the denomination already divided, and afterwards add to that product such number as there may be of that next denomination; divide this sum by the former divisor. In this manner proceed through the sum, and the several quotients are the answer.

The quotient is of the same denomination as the dividend.

EXAMPLES.

Divide 16*l.* 12*s.* 11*d.* 3*qrs.* by 7.

l. s. d. qrs.

7)16 12 11 3(2*l.* 7*s.* 6*d.* 3$\frac{3}{7}$*qrs.*

14

2

Multiply by 20

40

add the shillings 12

52

divide the 52 shillings by 7. 49

3

multiply by 12

36

add the pen. 11

47

divide 47 pence by 7. 42

5

multiply by 4

20

add the farthings 3

23

divide the farthings by 7. 21

remainder, 2

Divide 31*l.* 8*s.* 10*d.* 3*qrs.* by 3. *Ans.* 10*l.* 9*s.* 7*d.* 2$\frac{1}{3}$*qrs.*

Divide 18*l.* 19*s.* 6*d.* 1*qr.* by 8. *Ans.* 2*l.* 7*s.* 5*d.* 1$\frac{1}{2}$*qrs.*

Divide 115*l.* 7*s.* 10$\frac{1}{2}$*d.* by 21. *Ans.* 5*l.* 9*s.* 10*d.* 3$\frac{3}{21}$*qrs.*

Divide 389*l.* 8*s.* 11$\frac{3}{4}$*d.* by 88. *Ans.* 4*l.* 8*s.* 6$\frac{47}{88}$*d.*

Divide 9681*l.* 6*s.* 10*d.* 1*qr.* by 129.

Ans. 75*l.* 4*s.* 10*d.* 1$\frac{32}{129}$*qrs.*

Miscellaneous Examples.

Divide 49 lb. 6 oz. 11 pwt. 13 gr. by 4.

	lb.	*oz.*	*pwt.*	*gr.*	*lb.*	*oz.*	*pwt.*	*grs.*
4)	49	6	11	13 (	12	4	12	21¼.
	48							
	1							
Multiply by	12							
	12							
add 6 ounces	6							
divide the 18 ounces by 4.	18							
	16							
	2							
Multiply by	20							
	40							
add the penny-weights.	11							
divide the penny-weights by 4	51							
	48							
	3							
Multiply by	24							
	72							
add the grains	13							
divide the grains by 4.	85							
	84							
Remainder	1							

Divide 31 lb. 7 oz. 19 pwt. 20 gr. by 5.

Ans. 6 lb. 3 oz. 19 pwt. 23⅕ grs.

Divide 119 tons, 13 cwt. 3 qrs. 26 lb. 13 oz. 12 drs. by 6. *Ans.* 19 tons, 18 cwt. 3 qrs. 27 lb. 12 oz. 15⅚ dr.

Divide 71℔ 6℥ 6ℨ 2℈ 13 gr. by 7.
Ans. 10℔ 2℥ 5ℨ 1℈ 13$\frac{1}{7}$*grs.*

Divide 316 yds. 2 qrs. 3 na. by 8.
Ans. 39 yds. 2 qrs. 1$\frac{3}{8}$ na.

Divide 67 Ells, French, 5 qrs. 3 na. by 9.
Ans 7 E. Fr. 3 qrs. 1$\frac{2}{9}$ na.

Divide 290 bu. 3 pks. 6 qts 1 pt. by 12.
Ans. 24 bu. 0 pks. 7 qts. 1$\frac{1}{2}$ pts.

Divide 27 pipes, 1 hhd. 49 gal. 3 qts. 1 pt. 3 gi. by 11.
Ans. 2 pipes, 1 hhd. 4 gal. 2 qt. 0 pt. 1$\frac{4}{11}$ gi.

Divide 38 lea. 2 m. 6 fur. 39 rods, by 7.
Ans. 5 lea. 1 m. 5 fur. 22$\frac{5}{7}$ rods.

Divide 217 yds. 2 ft. 9. in. 2 b. c. by 21.
Ans. 10 yds. 1 ft. 1 in. 1$\frac{17}{21}$ b. c.

Divide 317 acres, 3 roods, 13 rods, by 27.
Ans. 11 acres, 3 roods, 3$\frac{13}{27}$ rods.

Divide 29 square yards, 7 square feet, 116 square inches, by 19. *Ans.* 1 yd. 5 ft 21$\frac{6}{9}$ in.

Divide 276 cords, 113 feet, 1618 inches, by 93.
Ans. 2 cords, 125 fl. 166$\frac{4}{9}$ in.

Divide 67 yrs. 8 mo. 2 w. 4 da. 13 h. 17 min. 38 sec. by 18. *Ans.* 3 yrs. 9. mo. 0 w 4 da. 3 h. 24 m. 18$\frac{14}{18}$ sec.

Divide 16 deg. 14 min. 12 sec. by 7
Ans. 2 deg. 19 min. 10$\frac{2}{7}$ sec.

PRACTICAL QUESTIONS.

If 9 persons pay 16*l.* 8*s.* 3$\frac{1}{2}$*d.* what is that for each?
Ans. 1*l.* 16*s.* 5*d.* 2$\frac{8}{9}$*qrs.*

If 13 sailors receive 119*l.* 8*s.* 4*d.* 3*qrs.* what is the portion of each? *Ans.* 9*l.* 3*s.* 8*d.* 2$\frac{9}{13}$*qrs.*

If a partnership, consisting of 5 persons, equally divide a capital of 3119*l.* 19*s.* 11*d.* 3*qrs.* what is the share of each? *Ans.* 623*l.* 19*s.* 11*d.* 3$\frac{4}{5}$*qrs.*

If 3 tierces of rice contain 868 cwt. 2 qrs. 14 lb. what does 1 contain? *Ans.* 289 cwt. 2 qrs. 4 lb. 10 oz. 10$\frac{2}{3}$ dr.

If 11 pieces of cloth contain 181 yards, what does 1 piece contain? *Ans.* 16 yds. 1 qr 3 $\frac{3}{11}$ na.

If 6 casks of wine contain 371 gallons, what does one contain? *Ans.* 61 gal. 3$\frac{1}{3}$ qts.

If a farm of 678 acres is divided among 7 heirs, how much has each? *Ans.* 96 acres, 3 roods, 17$\frac{1}{7}$ rods.

REDUCTION

is the process of changing numbers from one denomination to another, without altering their value.

ILLUSTRATION.

Let the scholar be asked how many shillings, pence, and farthings there are in one pound? To ascertain this, let him take a large square piece of paper, and let it represent one pound.—Then cut this pound into shillings, or twenty pieces; there are twenty shillings in one pound.

Now take these 20 shillings and cut them into pence, or 12 pieces each, and count them.—There are 240 pieces, that is 240 pence in one pound.

Now take these two hundred and forty pence, and cut them into farthings, or four pieces each, and there are 960; that is 960 farthings in one pound.

In one pound therefore there are 20 shillings 240 pence, and 960 farthings.

This is called Reduction Descending, or changing larger denominations into smaller.

Reduction Ascending, is changing small into larger denominations. This is performed by reversing the above operation; and instead of cutting or multiplying pounds into shillings, puts shillings pence and farthings together into pounds. To illustrate this, let the scholar be asked how many pence shillings and pounds there are in 960 farthings? And to answer this question, let the scholar take the pieces of paper before cut, and count them into parcels of 4 each. He will find 240 parcels, that is 240 pence.

Let him take these 240 pence, and lay them into parcels of shillings or 12 each—there are 20 shillings.

Take these twenty shillings, and they make 1 pound. In 960 farthings, therefore, there are 240 pence, 20 shillings, 1 pound.

REDUCTION DESCENDING.

RULE.

Multiply the highest denomination in the question by as many of the next denomination as make one of that highest; multiply the sum thus produced by as many of the next denomination as make one of the denomination preceding it; and so on till the sum is reduced to the denomination required. If there are several denominations in the question, add in the shillings when you multiply by shillings, pence when you multiply by pence, and farthings when you multiply by farthings.

EXAMPLES.

In 1 pound how many shillings, pence, and farthings?

1£
20 Multiply pounds by 20 and
—— it will bring them them into
20*s.* shillings.
12 Multiply shillings by 12
—— and it will bring them into
240*d.* pence.
4 Multiply pence by 4 and
—— it will bring them into far-
960*qrs.* things.

Thus in one pound there are 20*s.* 240*d.* and 960*qrs.*

NOTE.—If the scholar will make a comparison, he will find that multiplying the pounds, &c., produces exactly the same results as cutting the pieces of paper.

In 6£. how many farthings?

6
20
—
120
12
—
1440
4
—

Ans. 5760*qrs.*

In 3£. 6*s*. and 6*d*. how many farthings?

3*l*. 6*s*. 6*d*.
20 When you multiply
— by 20, add in the 6
66 shillings.
12 When you multiply
— by 12, add in the 6
798 pence.
4

Ans. 3192*qrs*.

In 76*l*. 8*s*. 3*d*. 3 *qrs*. how many farthings?

76*l*. 8*s*. 3*d*. 3*qrs*.
20
1528
12
18339
4

Ans. 73359*qrs*.

In 10*l*. 0*s*. 5*d*. how many farthings? *Ans*. 9620*qrs*.
In 61*l*. 11*s*. how many shillings? *Ans*. 1231*s*.
In 317*l*. 4*s*. 11*d*. how many pence? *Ans*. 76139*d*.
In 387*l*. how many shillings and pence?
Ans. 7740*s*. 92880*d*.
In 8760*l*. 18*s*. 10*d*. 3*qrs*. how many farthings?
Ans. 8410507*qrs*.

REDUCTION ASCENDING.

RULE.

Divide the denomination in the question by as many as it takes of that denomination to make one of the

next denomination: repeat this operation, till the quotient is brought to the denomination required.

EXAMPLES.

In 378261 *qrs.* how many pence, shillings, and pounds

To bring farthings into pence, divide by 4.

qrs. *d.*
4)378261(94565
36
18
16
22
20
26
24
21
20
Rem. 1 *farthing*

To bring pence into shillings, divide by 12.

d. *s.*
12)94565(7880
84
105
96
96
96
Rem. 5 *pence*

To bring shillings into pounds divide by 20.

s. *l*
20)7880(3
60
188
180
Rem. 8 *shi*

Thus, in 378261 *qrs.* there are 38 pounds, 8 shillings 5 pence, 1 farthing.

NOTE. The remainder is always of the same denomination as the dividend.

Bring 872683 farthings into pounds.

Ans. 909*l.* 0*s.* 10*d.* 3 *qrs.*

In 6872 pence, how many pounds?

Ans. 28*l.* 12*s.* 8*d.*

REDUCTION ASCENDING AND DESCENDING.

MONEY.

In 31*l.* 17*s.* 8*d.* 2*qrs.* how many farthings?

Ans. 30610*qrs.*

In 11367 farthings, how many pounds ?
Ans. 11*l.* 16*s.* 9*d.* 3*qrs.*
If 21 shillings make 1 guinea, how many shillings in 0 guineas ? *Ans.* 840 shillings.
In 70 guineas how many pounds ? *Ans.* 73*l.* 10*s.*
In 350 moidores at 36*s.* each, how many shillings ?
Ans. 12600*s.*
In 27 moidores, how many pence ? *Ans* 1664*d.*
Having borrowed 370 English crowns at 6*s.* 8*d.* each, w many pounds will pay the debt? *Ans.* 123*l.* 6*s.* 8*d.*
In 186 Dutch guilders at 2*s.* 4*d.* each, how many uineas ? *Ans.* 21 *guineas, and* 14 *shillings over.*
In 3708 cents, how many dollars ?

NOTE.—Reduction of mills to dollars, cents, &c. may e thus performed. Cut off the three right hand figures y a period for cents and mills, and the rest are dollars. Thus, 3848 mills makes 3 dollars, 84 cents, and 8 mills.

To reduce cents to dollars, cut off with a period the wo right hand figures for cents, and the rest are dollars. Thus, 3962 cents are $39,62 cts.

To reduce dollars to cents, annex two cyphers to the ight hand—thus, 387 dollars make 38700 cents. To educe cents to mills, annex one cypher—thus, 38700 ents make 387000 mills.

EXAMPLES.

In 86075 mills, how many cents ?
Ans. 8607 cents, 5 mills.
In 32971 cents, how many dollars ?
Ans 329 dollars, 71 cents.
In 92617 mills, how many dollars ?
Ans. 92 dollars, 61 cents, 7 mills.
In 389 dollars, how many cents ? *Ans.* 38900 cts.
In 7261 cents, how many mills ? *Ans.* 72610 mills.
In 3829 dollars, how many mills ?
Ans. 3829000 mills.

Weights and Measures.

EXAMPLES.

How many grains in a piece of silver that weighs 3 lb 7 oz 18 pwt?

Set the sum down thus:

lb.	*oz.*	*pwt.*	
3	7	18	
12			As 12 ounces make 1 pound, multiply the 3 lb. by 12, and add in the 7 oz.—It produces 43 ounces. Now as 20 penny-weights make 1 oz. multyply 43 by 20, and add in the 28.—It produces 878 penny-weights. Now as 24 grains make 1 penny-weight, multiply 878 by 24, which will produce the answer
—			
43			
20			
—			
878			
24			
—			
3512			
1756			
—			

Ans. 21072 *grains*

In 3 lb. 7 oz. 18 pwt. therefore there are 21072 grains.

In 47630 grains, how many pounds?

24)47630(1984 *pwt.*

24	
—	
236	
216	
—	
203	
192	
—	
110	
96	
—	
14	*grains*

20)1984(99 *pwt.*

180	
—	
184	
180	
—	
4	

12)99(8 *oz.*

96	
—	
3	

In 47630 grains it appears there are 8 lb. 3 oz. 4 pwts. and 14 grains.

In 3 lb. 7 oz. 11 pwt. 6 grains, how many grains? *Ans.* 21910.

In 3 cwt. 3 qrs. 21 lb. 10 oz. how many drams?
Ans. 113056.
In 3698 ounces, how many hundred weight?
Ans. 2 cwt. 0 qrs. 7 lb. 2 oz.
In 3 hhds. 4 gals. 2 qts. 1 pt. how many pints?
Ans. 1549.
In 3118 quarts, how many hogsheads?
Ans. 12 hhds. 23 gals. 2. qts.
In 3℔ 7℥ 2℈ 2Ð how many grains? *Ans.* 20820.
In 3863 grains, how many ounces?
Ans. 8℥ 0℈ 1Ð 3*gr.*
In 37 yds. 3 qrs. how many nails? *Ans.* 604.
In 314 nails, how many yards?
Ans. 19 yds. 2 qrs. 2 na.
In 763 quarts, how many bushels?
Ans. 23 bu. 3 pks. 3 qts.
In 31 bu. 1 pk. 6 qts. 1 pt. how many pints? *An.* 2013.
In 3 hhds. how many pints? *Ans.* 1512.
In 817 pints, how many hogsheads?
Ans 1 hhd. 39 gal. 0 qts 1 pt.
In 6389 barley-corns, how many rods?
Ans. 10 rds. 4 yds. 0 ft. 5 in. 2 b. c.
In 150 miles, 6 furlongs, 30 rods, how many inches?
Ans. 9557460.
How many cords of wood in 1115000 inches?
Ans. 5 cds. 5 ft. 440 in.
How many inches in 378 cords, 68 feet, 16 inches?
Ans. 83725072.
How many square rods in 3 acres, 2 roods? *An.* 560.
How many square feet in 16381 inches?
Ans. 113 ft. 109 in.
How many seconds in 365 days? *Ans.* 31536000.
How many months in 16380 hours?
Ans. 24 mo. 1 week 3 days 12 hours.
How many seconds in 1 sign, 13 deg. and 50 minutes?
Ans. 157800.
How many signs in 167368 seconds?
Ans. 1 sign 16 deg. 29 min. 28 sec.

In order to refresh the memory of the Scholar, the Teacher ask him the following Questions.

What is Arithmetic ?
Of how many principal rules does Arithmetic consist ?
What is Numeration ?
How do you know the signification of Figures ?
How do you write a sum in Figures ?
What is Addition ?
What is Simple Addition ?
Can you illustrate Simple Addition ?
How do you prove Simple Addition ?
What is Subtraction ?
What is Simple Subtraction ?
Will you give an illustration of Simple Addition ?
How do you prove Simple Addition ?
What is Multiplication ?
What is Simple Multiplication ?
Can you illustrate Simple Multiplication ?
How do you prove Multiplication ?
Have you completely learnt the Multiplication Table ?
What is Division ?
What is Simple Division ?
Will you illustrate it ?
How do you prove Division ?
What is Federal Money ?
How is it divided ?
How do you perform Addition of Federal Money ?
How do you perform Subtraction of Federal Money ?
How do you perform Multiplication of Federal Money ?
How do you perform Division of Federal Money ?
What are Fractions ?
Can you illustrate the idea of Fractions ?
How do you add halves and quarters or fourths together ?
How do you add mixed numbers ?
How do you subtract halves and quarters ?
How do you subtract mixed numbers ?
How do you find the half of a sum ?

How do you find a quarter or three quarters of a sum?
How do you multiply by mixed numbers?
How do you divide by a mixed number?
Do you understand the Table of Weights and Measures?
Can you illustrate the division of English Money?
What is Compound Addition?
How do you perform it?
What is Compound Multiplication?
How do you perform it?
What is Compound Division?
How do you perform it?
What is Reduction?
Can you illustrate it?
What is Reduction Ascending?
What is Reduction Descending?
How do you perform Reduction Ascending?
How do you perform Reduction Descending?